This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claim

1. (original) A method, comprising:

transferring from a first non-volatile storage unit of a plurality of non-volatile storage units, to a logic engine of a storage processor having a cache memory, a first unit of data stored in a stripe across said plurality of non-volatile storage units, in a first transfer operation which bypasses said cache memory;

transferring from a second non-volatile storage unit of said plurality of non-volatile storage units, to said logic engine, a second unit of data stored in said stripe, in a second transfer operation which bypasses said cache memory; and

constructing in said logic engine a third unit of data using said first unit of data transferred to said logic engine in said first transfer operation and using said second unit of data transferred to said logic engine in said second transfer operation.

2. (original) The method of claim 1 further comprising transferring said constructed third unit of data to a third non-volatile storage unit of said plurality of non-volatile storage units in a third transfer operation, and storing said constructed third unit of data in said stripe.

3. (original) The method of claim 2 wherein said third transfer operation bypasses said cache memory.

4. (original) The method of claim 2 wherein said plurality of non-volatile storage units are arranged in a Redundant Array of Independent Disks organization.

5. (original) The method of claim 4 wherein said second unit of data is parity data.

6. (original) The method of claim 5 wherein each non-volatile storage unit is a disk drive.

7. (original) The method of claim 6 wherein said stripe is organized as a Redundant Array of Independent Disks stripe of blocks of data including a block of parity data and each of said units of data is a block of data of said Redundant Array of Independent Disks stripe.

8. (original) The method of claim 7 wherein said logic engine includes a store queue capable of storing a block of data from said Redundant Array of Independent Disks stripe.

9. (original) The method of claim 1 wherein said cache memory of said logic engine is a random access memory.

10. (original) The method of claim 1 wherein said constructing in said logic engine a third unit of data includes applying said first unit of data transferred to said logic engine in said first transfer operation, to a store queue of said logic engine and performing an exclusive-OR logic function operation on the contents of said first store queue and said applied first unit of data, and includes applying said second unit of data transferred to said logic engine in said second transfer operation, to said store queue of said logic engine and performing an exclusive-OR logic function operation on the contents of said store queue and said applied second unit of data.

11. (original) The method of claim 2 further comprising:

transferring from a fourth non-volatile storage unit of said plurality of non-volatile storage units, to said logic engine, a fourth unit of data stored in said stripe, in a fourth transfer operation which bypasses said cache memory; and

transferring from a fifth non-volatile storage unit of said plurality of non-volatile storage units, to said logic engine, a fifth unit of data stored in said stripe, in a fifth transfer operation which bypasses said cache memory; and

wherein said constructing in said logic engine said third unit of data also uses said fourth unit of data transferred to said logic engine in said fourth transfer operation and using said fifth unit of data transferred to said logic engine in said fifth transfer operation prior to said transferring said constructed third unit of data to said third non-volatile storage unit in said third transfer operation.

12. (original) The method of claim 2 further comprising:

for each additional non-volatile storage unit of said plurality of storage units:

transferring from an additional non-volatile storage unit of said plurality of non-volatile storage units, to said logic engine, an additional unit of data stored in said stripe, in an additional transfer operation which bypasses said cache memory; and

wherein said constructing in said logic engine said third unit of data also uses said additional unit of data transferred to said logic engine in said additional transfer operation prior to said transferring said constructed third unit of data to said third non-volatile storage unit in said third transfer operation.

13. (original) The method of claim 1 further comprising:

transferring to said logic engine, a fourth unit of data which is new data to be stored in said stripe; wherein said first unit of data is old data to be replaced by said new data in said stripe, said second unit of data is old parity data to be replaced in said stripe and wherein said constructing in said logic engine said third unit of data constructs a replacement unit of parity data using said new data transferred to said logic engine, said method further comprising transferring said third unit of new parity data to said second non-volatile storage unit to replace said second unit of old parity data.

14. (currently amended) The method of claim 1 further comprising transferring said constructed third unit of data to a host in a third transfer operation.[.]

15. (original) The method of claim 1 wherein the storage processor issues read commands to said first and second non-volatile storage units so that said first and second units of data are accessed from said first and second non-volatile storage units at least partially in parallel.

16. (currently amended) An article of manufacture comprising a device having a storage medium, the storage medium comprising machine readable instructions stored thereon to:

transfer from a first non-volatile storage unit of a plurality of non-volatile storage units, to a logic engine of a storage processor having a cache memory, a first unit of data stored in a stripe across said plurality of non-volatile storage units, in a first transfer operation which bypasses said cache memory;

transfer from a second non-volatile storage unit of said plurality of non-volatile storage units, to said logic engine, a second unit of data stored in said stripe, in a second transfer operation which bypasses said cache memory; and

construct in said logic engine a third unit of data using said first unit of data transferred to said logic engine in said first transfer operation and using said second unit of data transferred to said logic engine in said second transfer operation.

17. (original) The article of claim 16 wherein the storage medium further comprises machine readable instructions stored thereon to transfer said constructed third unit of data to a third non-volatile storage unit of said plurality of non-volatile storage units in a third transfer operation, and store said constructed third unit of data in said stripe.

18. (original) The article of claim 17 wherein said third transfer operation bypasses said cache memory.

19. (original) The article of claim 17 wherein said plurality of non-volatile storage units are arranged in a Redundant Array of Independent Disks organization.

20. (original) The article of claim 19 wherein said second unit of data is parity data.

21. (original) The article of claim 20 wherein each non-volatile storage unit is a disk drive.

22. (original) The article of claim 21 wherein said stripe is organized as a Redundant Array of Independent Disks stripe of blocks of data including a block of parity data and each of said units of data is a block of data of said Redundant Array of Independent Disks stripe.

23. (original) The article of claim 22 wherein said logic engine includes a store queue capable of storing a block of data from said Redundant Array of Independent Disks stripe.

24. (original) The article of claim 16 wherein said cache memory of said logic engine is a random access memory.

25. (original) The article of claim 16 wherein the machine readable instructions to construct in said logic engine a third unit of data include machine readable instructions stored on the storage medium to apply said first unit of data transferred to said logic engine in said first transfer operation, to a store queue of said logic engine and perform an exclusive-OR logic function operation on the contents of said first store queue and said applied first unit of data, and to apply said second unit of data transferred to said logic engine in said second transfer operation, to said store queue of said logic engine and perform an exclusive-OR logic function operation on the contents of said store queue and said applied second unit of data.

26. (original) The article of claim 17 wherein the storage medium further comprises machine readable instructions stored thereon to:

transfer from a fourth non-volatile storage unit of said plurality of non-volatile storage units, to said logic engine, a fourth unit of data stored in said stripe, in a fourth transfer operation which bypasses said cache memory; and

transfer from a fifth non-volatile storage unit of said plurality of non-volatile storage units, to said logic engine, a fifth unit of data stored in said stripe, in a fifth transfer operation which bypasses said cache memory; and

wherein the machine readable instructions to construct in said logic engine a third unit of data include machine readable instructions stored on the storage medium to use said fourth unit of data transferred to said logic engine in said fourth transfer operation and to use said fifth unit of data transferred to said logic engine in said fifth transfer operation prior to said transferring said constructed third unit of data to said third non-volatile storage unit in said third transfer operation.

27. (original) The article of claim 16 wherein the storage medium further comprises machine readable instructions stored thereon to:

transfer to said logic engine, a fourth unit of data which is new data to be stored in said stripe; wherein said first unit of data is old data to be replaced by said new data in said stripe, said second unit of data is old parity data to be replaced in said stripe and wherein the machine readable instructions to construct in said logic engine a third unit of data include machine readable instructions stored on the storage medium to construct a replacement unit of parity data using said new data transferred to said logic engine, said wherein the storage medium further comprises machine readable instructions stored thereon to transfer said third unit of new parity data to said second non-volatile storage unit to replace said second unit of old parity data.

28. (original) The article of claim 16 wherein the storage medium further comprises machine readable instructions stored thereon to transfer said constructed third unit of data to a host in a third transfer operation.

29. (original) The article of claim 16 wherein the storage medium further comprises machine readable instructions stored thereon to issue read commands to said first and second non-volatile storage units so that said first and second units of data are accessed from said first and second non-volatile storage units at least partially in parallel.

30. (original) A system, comprising:

at least one memory which includes an operating system and an application;

a processor coupled to the memory;

data storage having a plurality of non-volatile storage units;

a data storage processor adapted to manage Input/Output (I/O) access to the data storage and having a cache memory and a logic engine; and

a device driver executable by the processor in the memory, wherein at least one of the application, operating system, device driver and the storage processor is adapted to:

transfer from a first non-volatile storage unit to said logic engine of said storage processor, a first unit of data stored in a stripe across said plurality of non-volatile storage units, in a first transfer operation which bypasses said cache memory;

transfer from a second non-volatile storage unit of said plurality of non-volatile storage units, to said logic engine, a second unit of data stored in said stripe, in a second transfer operation which bypasses said cache memory; and

construct in said logic engine a third unit of data using said first unit of data transferred to said logic engine in said first transfer operation and using said second unit of data transferred to said logic engine in said second transfer operation.

31. (original) The system of claim 30 wherein said at least one of the application, operating system, device driver and the storage processor is further adapted to transfer said constructed third unit of data to a third non-volatile storage unit of said plurality of non-volatile storage units in a third transfer operation, and store said constructed third unit of data in said stripe.

32. (original) The system of claim 31 wherein said third transfer operation bypasses said cache memory.

33. (original) The system of claim 31 wherein said plurality of non-volatile storage units are arranged in a Redundant Array of Independent Disks organization.

34. (original) The system of claim 33 wherein said second unit of data is parity data.

35. (original) The system of claim 34 wherein each non-volatile storage unit is a disk drive.

36. (original) The system of claim 35 wherein said stripe is organized as a Redundant Array of Independent Disks stripe of blocks of data including a block of parity data and each of said units of data is a block of data of said Redundant Array of Independent Disks stripe.

37. (original) The system of claim 36 wherein said logic engine includes a store queue capable of storing a block of data from said Redundant Array of Independent Disks stripe.

38. (original) The system of claim 30 wherein said cache memory of said logic engine is a random access memory.

39. (original) The system of claim 30 wherein to construct in said logic engine a third unit of data, said at least one of the application, operating system, device driver and the storage processor is further adapted to apply said first unit of data transferred to said logic engine in said first transfer operation, to a store queue of said logic engine and perform an exclusive-OR logic function operation on the contents of said first store queue and said applied first unit of data, and to apply said second unit of data transferred to said logic engine in said second transfer operation, to said store queue of said logic engine and perform an exclusive-OR logic function operation on the contents of said store queue and said applied second unit of data.

40. (original) The system of claim 31 wherein said at least one of the application, operating system, device driver and the storage processor is further adapted to transfer from a fourth non-volatile storage unit of said plurality of non-volatile storage units, to said logic engine, a fourth unit of data stored in said stripe, in a fourth transfer operation which bypasses said cache memory; and

transfer from a fifth non-volatile storage unit of said plurality of non-volatile storage units, to said logic engine, a fifth unit of data stored in said stripe, in a fifth transfer operation which bypasses said cache memory; and

wherein to construct in said logic engine a third unit of data, said at least one of the application, operating system, device driver and the storage processor is further adapted to use said fourth unit of data transferred to said logic engine in said fourth transfer operation and to use said fifth unit of data transferred to said logic engine in said fifth transfer operation prior to said transferring said constructed third unit of data to said third non-volatile storage unit in said third transfer operation.

41. (original) The system of claim 30 wherein said at least one of the application, operating system, device driver and the storage processor is further adapted to transfer to said logic engine, a fourth unit of data which is new data to be stored in said stripe; wherein said first unit of data is old data to be replaced by said new data in said stripe, said second unit of data is old parity data to be replaced in said stripe and wherein the machine readable instructions to construct in said logic engine a third unit of data include machine readable instructions stored on the storage medium to construct a replacement unit of parity data using said new data transferred to said logic engine, said wherein the storage medium further comprises machine readable instructions stored thereon to transfer said third unit of new parity data to said second non-volatile storage unit to replace said second unit of old parity data.

42. (original) The system of claim 30 wherein said at least one of the application, operating system, device driver and the storage processor is further adapted to transfer said constructed third unit of data to a host in a third transfer operation.

43. (original) The system of claim 30 wherein said at least one of the application, operating system, device driver and the storage processor is further adapted to issue read commands to said first and second non-volatile storage units so that said first and second units of data are accessed from said first and second non-volatile storage units at least partially in parallel.

44. (original) A device for use with a data storage having a plurality of non-volatile storage units, comprising:

a data storage processor adapted to manage Input/Output (I/O) access to the data storage and having a cache memory and a logic engine, wherein the storage processor is further adapted to:

transfer from a first non-volatile storage unit to said logic engine of said storage processor, a first unit of data stored in a stripe across said plurality of non-volatile storage units, in a first transfer operation which bypasses said cache memory;

transfer from a second non-volatile storage unit of said plurality of non-volatile storage units, to said logic engine, a second unit of data stored in said stripe, in a second transfer operation which bypasses said cache memory; and

construct in said logic engine a third unit of data using said first unit of data transferred to said logic engine in said first transfer operation and using said second unit of data transferred to said logic engine in said second transfer operation.

45. (original) The device of claim 44 wherein the device is further adapted to transfer said constructed third unit of data to a third non-volatile storage unit of said plurality of non-volatile storage units in a third transfer operation, and store said constructed third unit of data in said stripe.

46. (original) The device of claim 45 wherein said third transfer operation bypasses said cache memory.

47. (currently amended) The device of claim 45 wherein ~~wherein~~ each non-volatile storage unit is a disk drive, said plurality of non-volatile storage units are arranged in a Redundant Array of Independent Disks organization, said stripe is organized as a Redundant Array of Independent Disks stripe of blocks of data including a block of parity data and each of said units of data is a block of data of said Redundant Array of Independent Disks stripe.

48. (original) The device of claim 47 wherein said logic engine includes a store queue capable of storing a block of data from said Redundant Array of Independent Disks stripe, said cache memory of said logic engine is a random access memory, and to construct in said logic engine a third unit of data, said storage processor is further adapted to apply said first unit of data transferred to said logic engine in said first transfer operation, to a store queue of said logic engine and perform an exclusive-OR logic function operation on the contents of said first store queue and said applied first unit of data, and to apply said second unit of data transferred to said logic engine in said second transfer operation, to said store queue of said logic engine and perform an exclusive-OR logic function operation on the contents of said store queue and said applied second unit of data.

49. (original) The device of claim 44 wherein said storage processor is further adapted to transfer said constructed third unit of data to a host in a third transfer operation.

50. (original) The device of claim 44 wherein said storage processor is further adapted to issue read commands to said first and second non-volatile storage units so that said first and second units of data are accessed from said first and second non-volatile storage units at least partially in parallel.